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# Precarious prospects? Exploring climate resilience of agricultural commercialization pathways in Tanzania and Zimbabwe

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**ABSTRACT**

Smallholder agricultural commercialization is a central objective across Africa, one linked to poverty reduction, sectoral transformation and increasingly, climate resilience and adaptation. There is much attention given to the extent to which agricultural commercialization serves to reduce poverty, but less to the commercialization pathways that lead towards or away from that outcome. There are, likewise, many studies that project hugely adverse future impacts of climate change on commercial agricultural production, but surprisingly little empirical work on how climate impacts are affecting current agricultural commercialization prospects and pathways for smallholder farmers. This paper, therefore, offers an analysis of levels of climate vulnerability and resilience within existing commercialization pathways in Tanzania and Zimbabwe. It embeds the account within an analysis of the underlying causes of uneven distributions of vulnerability and resilience. We find that while being able to practise commercially viable agriculture can contribute to resilience, it does not do so for the people who most need commercialization to reduce poverty. It is more common for farmers to face what we term an adaptation trap. We conclude by considering what these cases add to our understanding of climate-smart agriculture (CSA).

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Agricultural commercialization; adaptation; resilience; climate change; vulnerability

## 1. Introduction

Smallholder farm commercialization is the process of smallholder farm households shifting "from semi-subsistence agriculture to production primarily for the market" (Poulton & Chinsinga, 2018, p. 4). Commercialization is typically conceived as the direction of travel for agricultural transformation (Poulton et al., 2010; Timmer, 1988) and a fundamental policy objective therein. For instance, it has been central to the AU-initiated Comprehensive Africa Agriculture Development Programme (CAADP), in particular Pillar II, which focused on supporting farmers to "meet the increasingly complex requirements of domestic, regional and international markets" (Wellard Dyer, 2013, p. 1). The most obvious reason as to why agricultural commercialization has been given this prominent billing is because it is often held to be a route out of poverty for billions of rural inhabitants across the Global South (Christiaensen et al., 2011; Lowder et al., 2016). It is therefore seen as central to the development agenda (De Janvry & Sadoulet, 2010; Dorosh & Mellor, 2013; World Bank, 2008), even if the evidence on its efficacy is mixed (Bloom, 2015; Reardon et al., 2009; Rutherford et al., 2016).

Commercialization has also been proposed as a way to support climate change adaptation (e.g. Thomas et al., 2007), and more broadly as part of climate-smart agriculture (CSA) interventions (Eriksen et al., 2019). Based on sustainable intensification, reducing agricultural vulnerability and mitigating greenhouse gas emissions, central to CSA is the impetus to switch to modes of agricultural production capable of fostering synergies between these three objectives, rather than setting them up in conflict with each other (Campbell et al., 2014; FAO, 2013; Jayne et al., 2018; Sitko & Jayne, 2018; World Bank, 2015).

Whilst there is a large literature on the projected implications of climate change for smallholder agriculture (e.g. Giller et al., 2021b; Stringer et al., 2020), and whilst much has been written on CSA (e.g. Abegunde et al., 2019; Lipper et al., 2014), there is still surprisingly little empirical research on how climate impacts are affecting *current* agricultural commercialization prospects and pathways for smallholder farmers (Dorward & Giller, 2022; Kuhl, 2018). Most efforts toward commercialization do not, after all, come under the auspices of a World Bank or FAO climate-smart agriculture intervention. To this end, we start to fill these gaps by presenting a climate vulnerability analysis of 'actually existing' commercialization pathways and strategies in Singida, Tanzania and Mazowe, Zimbabwe. Our work is rooted in larger studies conducted under the auspices of the Agricultural Policy Research Africa (APRA) initiative, but this paper focuses on three key issues:

1. We determine the role and importance of climate change among the local and external factors driving farm-level decisions.

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2. We explore the farm-level strategies for tackling climate-related uncertainties that farmers are using, and how they are affecting outcomes.
3. We address the question of what particular barriers and opportunities exist for changing crops in response to changing climate signals, and whether there are particular lock-ins that would make changes difficult.

In order to better situate climate change impacts within the much wider dynamics and processes shaping commercialization prospects in Tanzania and Zimbabwe, we use a modified version of the 'pressure and release' framework (Wisner et al., 2004). We add a new layer to it by capturing the relational, mutually constitutive character of the social, political, economic and ecological processes generative of vulnerability to climate impacts, poverty and inequality. This addresses the critiques contending it lacks this element, as made by authors such as Leichenko and O'Brien (2008), and brings it into productive conversation with the 'relational ontological turn' which is changing our understanding of human-environmental relations across the social sciences. We argue that increasing risks and uncertainties from climate change, in combination with a much wider range of factors which shape the viability of commercial agriculture – and who it is viable for – are pushing many farmers towards what might, adapting a concept associated with the work of Dercon (1996; Dercon & Christiaensen, 2011), be called an 'adaptation trap'.

Difficulties like these, the avoidance of which are implicit in calls for climate-smart agriculture (see i.e. World Bank, 2015), might make Tanzania and Zimbabwe seem obvious candidates for its adoption. However, we conclude by registering our scepticism that the technical solutions and modifications to the functioning of markets that efforts such as climate-smart agriculture entails would address the underlying causes of vulnerability faced by poorer farmers in both Tanzania and Zimbabwe. We join other commentators (i.e. Karlsson et al., 2018; Newell & Taylor, 2018 Taylor, 2018;) in arguing that the success of CSA and similar efforts to promote climate-resilient agriculture is much more contingent upon change to wider systemic dynamics – access to resources underpinning adaptation (notably land), markets, the placing of small-scale commercial farmers in national and international crop commodity chains – than on what individual farmers can do with the right crop or farming system.

## 2. Background, theory and methodology

### 2.1 Conceptual framework

We situate farm-level decision making in agricultural commercialization pathways in relation to a modified version of Wisner et al.'s (2004) 'Pressure and Release' (PAR) framework. We use this framework because it seeks to produce a deeper understanding of how environmental hazards (in this case climate impacts) combine with social, political and economic dynamics to produce uneven distributions of vulnerability and harm within and across societies. We thus use this to bring into focus the broader 'conditions of possibility' impinging upon the vulnerability or resilience of the commercialization strategies we find in our Tanzanian and Zimbabwean field sites. We propose that it is these, rather than potential synergies postulated by the notions of climate-resilient or climate-smart agriculture, or individual cropping decisions by farmers, that will ultimately determine the prospects for climate-resilient, poverty reducing commercial agriculture.

The underlying causal logic of PAR is the 'progression of vulnerability': root causes, dynamic pressures and unsafe conditions, in combination with the 'trigger event' of an environmental hazard, lead to potentially dizastrous outcomes. In our modified PAR iteration, the 'progression of vulnerability' logic therefore remains intact. The changes we have made fall into two categories: first, tailoring the framework to our requirements; and second, more widely salient innovations.

*Tailoring the framework:* first, we narrowed the range of hazards in the framework's rightmost column to those related most directly to climate change. Second, with a view to better integrating the framework with our participatory vulnerability analysis (Ulrichs et al., 2015), we adjusted the 'unsafe places' column (see following section). Third, the impacts of climate change can be not just immediate but also cumulative, irregular, or attritional, in ways that do not always give rise to a single, time-bound 'disaster event'. For this reason, we swapped the 'disaster risk' at the centre of the framework for a focus on 'outcomes'.

*More widely salient innovations:* first, we locate thinking around access within the PAR model itself, rather than as an adjunct framework in chapter 3 of Wisner et al. (2004), and to adopt the comparatively pared-back conceptualization of access proposed by Ribot and Peluso (2003), with its focus on rights-based, structural and relational mechanisms. This allows us to place access as a mediating force between the dynamic pressures and fragile livelihoods/unsafe locations columns.

Our second innovation is an attempt to visualize better the relational, mutually constitutive character of the social, political, economic and ecological processes generative of vulnerability. To date, the framework has suggested that dynamic pressures and fragile livelihoods can contribute to the character of environmental hazards, with deforestation, for instance, increasing both the likelihood and the magnitude of a flood. Yet this does not acknowledge the extent to which climate impacts, and climate change more broadly, can influence the character of both the dynamic pressures and the root causes through which the progression of vulnerability unfolds. For instance, climate change is a by-product of the commodified and consumed environments shaped by global relations of capital but is now a threat to capitalism itself (Harvey, 2007; Klein, 2014; Moore, 2017). It is in understanding that capitalism and climate change are both socio-environmental processes, not wholly separable from each other, that thinking relationally becomes useful.

In practice, capturing this idea of 'relationality' visually has simply entailed extending the arrows at the top and bottom of the original framework also to run in the reverse direction. As cosmetic an adjustment as that may seem, it underpins our wider argument that this framework continues to be relevant within (and beyond) political ecology, and especially to the 'relational ontological turn' that has become so central to it since the 2000s.[1]

Ultimately, this framework can help explain farm-level commercialization decisions and also to what extent these are climate-resilient. In other words, do farmers have 'room for manoeuvre' given the constraints they are working under, and to what extent can they forge commercialization pathways that support long term climate resilience?

### 2.2 Methodological operationalization

In order to operationalize this framework, we deployed a mixed-methods analysis. This integrated elements of both qualitative and quantitative methods, and enabled exploitation of strengths of each approach, through triangulation and complementarity of results. The qualitative methods comprized an adaptation of the Participatory Vulnerability Analysis by Ulrichs et al. (2015), and were co-developed alongside the modifications made to the 'unsafe places' column of the conceptual framework. Our toolkit is similar to other vulnerability analysis toolkits (e.g. CARE, 2009; IISD, 2012) in a number of ways, and not least in its deployment of participatory methods. What distinguishes it from these is that its analysis of local level vulnerability to climate impacts grounded in the deeper conceptualization of vulnerability provided by the PAR framework.

To secure the fit between the vulnerability analysis toolkit and its conceptual underpinnings, we inserted within 'unsafe places' column what we term the five 'dimensions of vulnerability' (DoV): livelihood strategies, well-being, individual capacity, collective capacity and governance. Each dimension of vulnerability was assessed sequentially by relevant participatory tools: village mapping, transect walk, historical timelines, subjective well-being assessment, livelihoods and seasonal calendar, temporal farm-sector changes with underlying drivers, institutional roles, and individual life histories. The quantitative methods involved analysis of secondary data/literature, APRA household questionnaire surveys and other panel data collected in both countries (Mdoe et al., 2021; Shonhe, 2018; 2021; Shonhe et al., 2020). We utilized this data and secondary sources to flesh out the 'root causes' and 'dynamic pressures' elements of the framework.

The comparative dimension of this research consists in essence of following the implications of climate change for agricultural commercialization in Tanzania and Zimbabwe. However, the study is not symmetrical in every aspect of its design and site selection. Each climate study was located within larger APRA country studies linked by overarching comparative objectives but necessarily specific to each country context. This meant that, for instance, we did not choose field sites in both countries on the basis of similarity of agro-climatic regions, but focussed more on the prospects for commercialization in each country. In Tanzania work was already ongoing in semi-arid Singida, making it easier to find sites in a dryer, more exposed area in which at least some commercial activities were being undertaken. Yet the APRA data in Zimbabwe largely focussed on tobacco, and because tobacco is a crop that ties together climate and commercial agriculture, we did not seek to choose field sites located in drier areas. Moreover, the studies also had to accommodate the divergent histories of each country. For example, as a former settler colony, the history of land dispossession, redistribution and ownership in Zimbabwe makes for a strikingly different agrarian regime, across the twentieth and twenty-first centuries, to that of Tanzania, formerly under indirect rule. The comparison offered here is therefore as much about capturing specificity as it is about presenting cross-country commonalities.

A note of clarification on the use of climate data in this research and the question of attribution. 'Downscaled' climate projections under a business-as-usual scenario indicate that, in the semi-arid central Tanzania, the mean annual temperature will increase by 1.0–2.7°C and rainfall by up to 200 mm per annum by the 2060s, but importantly accompanied by increased seasonal variability and significant climate-related uncertainty (Kilembe et al., 2013; Tumbo et al., 2020). 'Downscaled' projections for Zimbabwe (World Bank, 2021), suggest annual temperatures will increase in the mid-century period 2040–2059 varying between 1.2 and 2.2°C in 2040–2059, and between 1.0°C (RCP 2.6) and 5.1°C (RCP 8.5) by 2080–2099. Median annual precipitation is projected to decrease approximately between 1.2 per cent (RCP 2.6) and 4.4 per cent (RCP 8.5) by mid-century, albeit with significant regional variation. Significantly, rainfall is projected to decrease more during the rainy season (Oct–Mar). However, it should be noted for both countries that downscaling of general circulation models, with a view to offering country-specific assessments, amplify rather than reduce existing uncertainties over which models accurately capture the effects of different emissions pathways (Conway et al., 2019). For this reason, we focus more on observed historical trends and impacts than on future projections, where data were available (more so in Zimbabwe than Tanzania). They are a much better guide to what farmers are currently experiencing; and c) give a clearer sense of the strengths and limits of existing adaptive capacity (see Conway et al., 2019 Newsham et al., 2021 and Wilby & Dessai, 2010 for a more detailed consideration of the underpinnings of this 'bottom-up' approach to vulnerability).

However, the use of observed trend data does raise the question of whether the impacts farmers have experienced can be attributed to climate change (see Selby et al., 2017 for an illuminating example of quite how deep this question runs). The ZINGSA (2020) data for Zimbabwe describes, amongst other phenomena, profound and largely adverse changes the rainy season, from an agro-ecological perspective. It has no compunction, moreover, in attributing these changes to climate change. As social scientists, we are poorly-positioned to confirm or contest the accuracy of this attribution. However, the observed data are consistent with general circulation model projections of warming attributed to humans (IPCC, 2021). Ultimately, moreover, it is the magnitude of climate impacts, whatever their cause, which is important for understanding questions of vulnerability.

### 2.3 Field sites

#### 2.3.1 Singida, Tanzania

The study in Tanzania were carried out in three villages in Mkalama and Iramba Districts, Singida Region, in the central semi-arid parts of the country (see Figure 1). The choice of

Singida was informed by the wider APRA programme study on agricultural commercialization (see Mdoe et al., 2021). Singida is part of the semi-arid regions of Tanzania, occupying over 50% of the country's landmass (Hatibu et al., 1999; Yanda et al., 2015). Smallholder farmers in the semi-arid drylands have lived on agriculture pursued in precarious farming environment. Rainfall is low and erratic with a (broadly) unimodal pattern. Rainfall typically starts in November and ends in May, with an intermittent dry spell in February. Crop production is mainly rainfed, with some limited seasonal supplementary irrigation for paddy and horticulture production using dams, groundwater and runoff. The major crops grown include maize, onion, millet, sorghum, groundnuts, cassava, sweet potatoes, beans, paddy, chickpeas, sunflower and cotton. Mean annual rainfall in the study districts ranges between 400 and 1100 mm. Average seasonal rainfall even in the peak rainy months of March and April has not exceeded 160 mm per month.

The area is a part of Tanzania that has traditionally been economically and politically marginalized. Semi-arid areas are prominent in production of dryland crops such as sorghum, millet and pulses, but the value chains of such crops are underdeveloped and with low commercialization levels. The central semi-arid areas have received disproportionately less public investments than other parts of the country, and hence been left with less effective social and economic services, fragile food systems, and higher levels of poverty as compared to higher potential areas (IFAD, 2016).

Singida is considered to have considerable agricultural potential, given appropriate technology and commodity market access. Key commercial crops in Singida include onions, tobacco, cotton and oilseeds. Semi-arid areas are also important in terms of traditional livestock systems. Singida region ranks only second to Tabora region in the country in terms of chicken production, accounting for about 6% (2.5 million) of the country's total indigenous chicken population (URT, 2021).

The future of dryland agricultural enterprises in Singida is at increased risk in the face of climate change. Climate projections under a business-as-usual scenario indicate that, in the semi-arid central Tanzania, the mean annual temperature will increase by 1.0–2.7°C and rainfall by up to 200 mm per annum by the 2060s, but importantly accompanied by increased seasonal variability and significant climate-related uncertainty (Kilembe et al., 2013; Tumbo et al., 2020) (Figure 2).

### 2.3.2 Mazowe, Zimbabwe

The key criterion for field site selection in Mazowe, Zimbabwe, was the type of land tenure, and the reason for this cannot be understood in the absence of a brief history of land ownership and distribution in the country. Since the late nineteenth century, the production of tobacco in Mazowe, a district of Mashonaland Central, has been inextricably linked to Zimbabwe's colonial history, and in particular to the history of land ownership. The annexation of modern Zimbabwe by the British Empire in the 1880s produced a settler colony which turned over land to European settlers for farming and mining. The Land Apportionment Act of 1930 allocated 51% of land in modern Zimbabwe – including the best agricultural land – to white settlers, who constituted just 4% of the population (Matondi, 2012). The dispossessed African population was mostly relegated to tribal trust lands, barren and dry areas of the country which, following independence in 1980, would be redesignated as the communal areas in which millions of Zimbabweans continue to live. From 1901, Mvurwi became a site of European settler tobacco production (Kwashirai, 2006). Via generous state support, the crop became a critical contributor to the national economy by the 1920s and remains so.

From 2000, the Fast-Track Land Reform Programme (FTLRP) fashioned a new agrarian political economy (Shonhe, 2018), in two main ways. First, the state appropriated, without compensation, over 10 million ha of land from 4,500 white large-scale commercial farmers (LSCFs). The FTLRP redistributed this land to black Zimbabweans in the form of two different categories of long-term farmland lease, both intended to increase commercial production. The first of these was A1 farms, intended for subsistence and small-scale commercial farming (SSCF), originally intended to be 5–10 ha (Hanlon et al., 2013). The second was A2 farms, of around 50–200 ha, intended for applicants who could demonstrate that they were in a position to embark on medium-large-scale commercial farming. As a result of the FTLRP, over 145,775 family farmers were given A1 leases, with an average of 20ha of land. 22,896 A2 medium and small-scale commercial farmers (SSCFs) were given average of 142ha. Second, the FTLRP led small and medium scale farmers to switch from food to cash crops (tobacco, soybeans and sugar beans), thereby starting to become incorporated into global value chains (Scoones et al., 2010). Since 2010, the adoption of tobacco in particular has been vertiginous. By 2018 there were 124,000 registered tobacco producers, a stark contrast with the 1500 tobacco producers registered at the time of Zimbabwean independence in 1980 (Garwe, 2019; TIMB, 2018).

The centrality of post-2000 land reform in transforming access to land in agrarian Zimbabwe is so profound that it was essential to select field sites in both communal area and redistributed land. Our study therefore comprized three field sites in Mazowe: Chiweshe, a communal area; Hariana, an A1 farm; and Arrowan, an A2 farm (see Figure 3). Chiweshe, Hariana and Arrowan were specifically selected for the following reasons: (a) They had already featured in prior APRA studies, and therefore allowed triangulation and contextualization of existing data; (b) they could be identified, using existing APRA data, as sites in which substantial levels of tobacco production were occurring; (c) they were well-known to the agricultural extension staff who facilitated field site access, had detailed knowledge of them and longstanding, good relations with their inhabitants; and (d) the three sites are operated at different scale of farming and land tenure systems within Mazowe district, as is the case country-wide.

## 3. Results and discussion[2]

### 3.1 The role of climate and other factors influencing choice of crops for commercialization

The case studies show how a mix of underlying drivers (root causes), dynamic drivers and access ultimately drives farm-

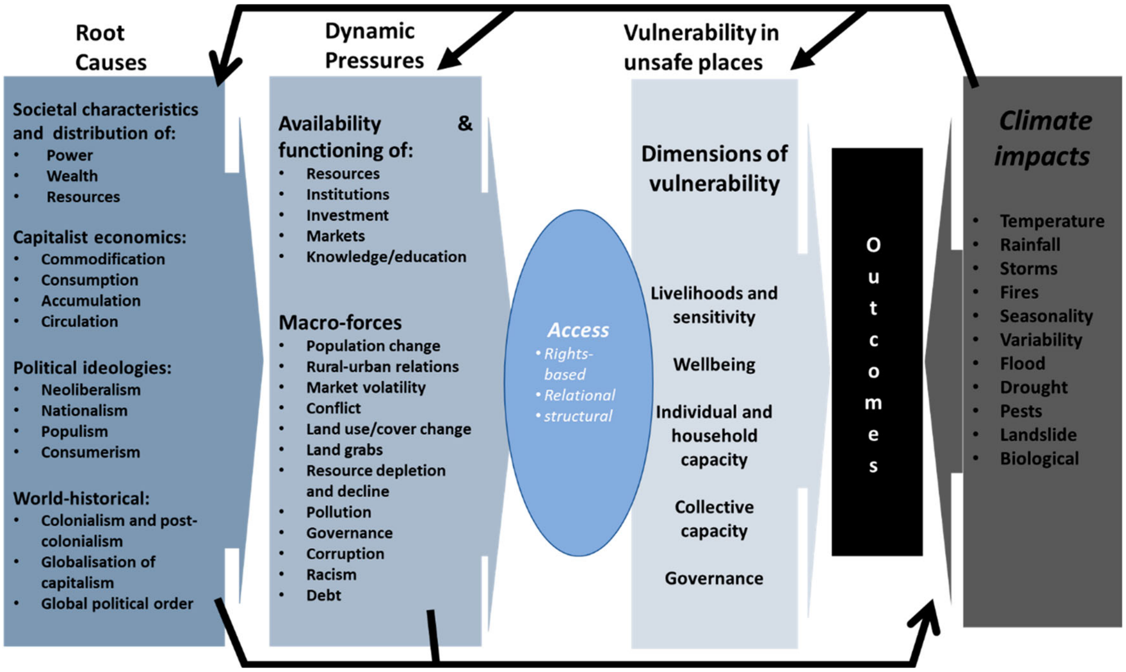


**Figure 1.** Modified Pressure and Release Framework, adapted from Wisner et al. (2004).

level decisions and exacerbates vulnerability by limiting the options for the choice of crops. Climate change features significantly as a factor, but the range of crops are already set by the broader political economic and dynamic drivers. Here we focus on the climate impacts which have the greatest impact on commercial cropping decisions, rather than attempt to cover the range of all impacts across all cropping strategies.

### 3.1.1 Singida, Tanzania

New commercialization opportunities over recent years have made farmers in Singida look for new crops, such as cotton and sunflower. With climate change and increasing weather extremes, however, dryland agrarian communities in Singida region face increasing challenges. Mutabazi and Boniface (2021) showed that the majority of farmers have stuck with low-risk low-return dryland crops such as sorghum, pearl millet and sweet potato that were bred for drought tolerance (see Table 1). However, with increasing incidences of above-average rainfall in some locations, such dryland crops have suffered from excessive moisture. On the one hand, increasing incidences of excessive rains are affecting crops meant to withstand water stress such as onion, sunflower and sorghum. As a farmer from Dominiki village explained “This year, rains were excessive, so I managed to grow many crops, though sorghum was affected because of too much rains”.

At the same time, these changes have also created new possibilities for some better off farmers to grow high-value, water-demanding crops such as paddy, chickpea and horticulture. Increased episodes of heavy rains have also increased moisture levels in lowlands and flows in seasonal rivers, hence creating new possibilities for these crops. However, these emerging commercialization opportunities do not benefit everyone equally,, and may on the contrary reinforce existing resource-access disparity and income inequality. For example, some new opportunities for crop farming created by the changing climate are exclusively available to pastoral families that settled on the previously drier lowlands where they grazed their cattle, and are not available to traditional crop farmers that settled on uplands with relatively less fertile sandy soils.[3] A quote from a farmer in Luono village illustrates this: “My farm is on sandy soil and cannot be irrigated. If you get an irrigated farm for paddy production as in the case of our colleagues (*Sukuma*), farming is profitable”. This pattern has been reinforced by a rising demand for land suited to growing onions, driving rents up, which are unaffordable to resource-poor farmers.

### 3.1.2 Mazowe, Zimbabwe

In Mazowe, changes in climate are worryingly important, but need to be situated within a wider array of dynamic pressures, the effects of which are mediated through differentiated access dynamics, especially around irrigation but also inputs, markets and finance.

Of greatest significance are observed climate trends since the 1980s The starkest finding in recent research by the Zimbabwe National Geospatial and Space Agency (ZINGSA) is the drying trend across Zimbabwe (ZINGSA, 2020, pp. 10–11). This is most manifest in the late onset and early termination of a rainfall season shortened by 30 days, a decrease in the number of rainfall days and an increase in the number of dry spells of up to 20 days, which affect water availability and crop productivity. Even our field sites in Mvurwi, classified as a high potential farming region, have experienced a decline in rainfall over recent years since 2000 in a way consistent with the national picture.

The impacts of these changes registered across our field sites. Farmers voiced concern at the shorter, more erratic rainy season, punctuated by longer dry spells, and in particular

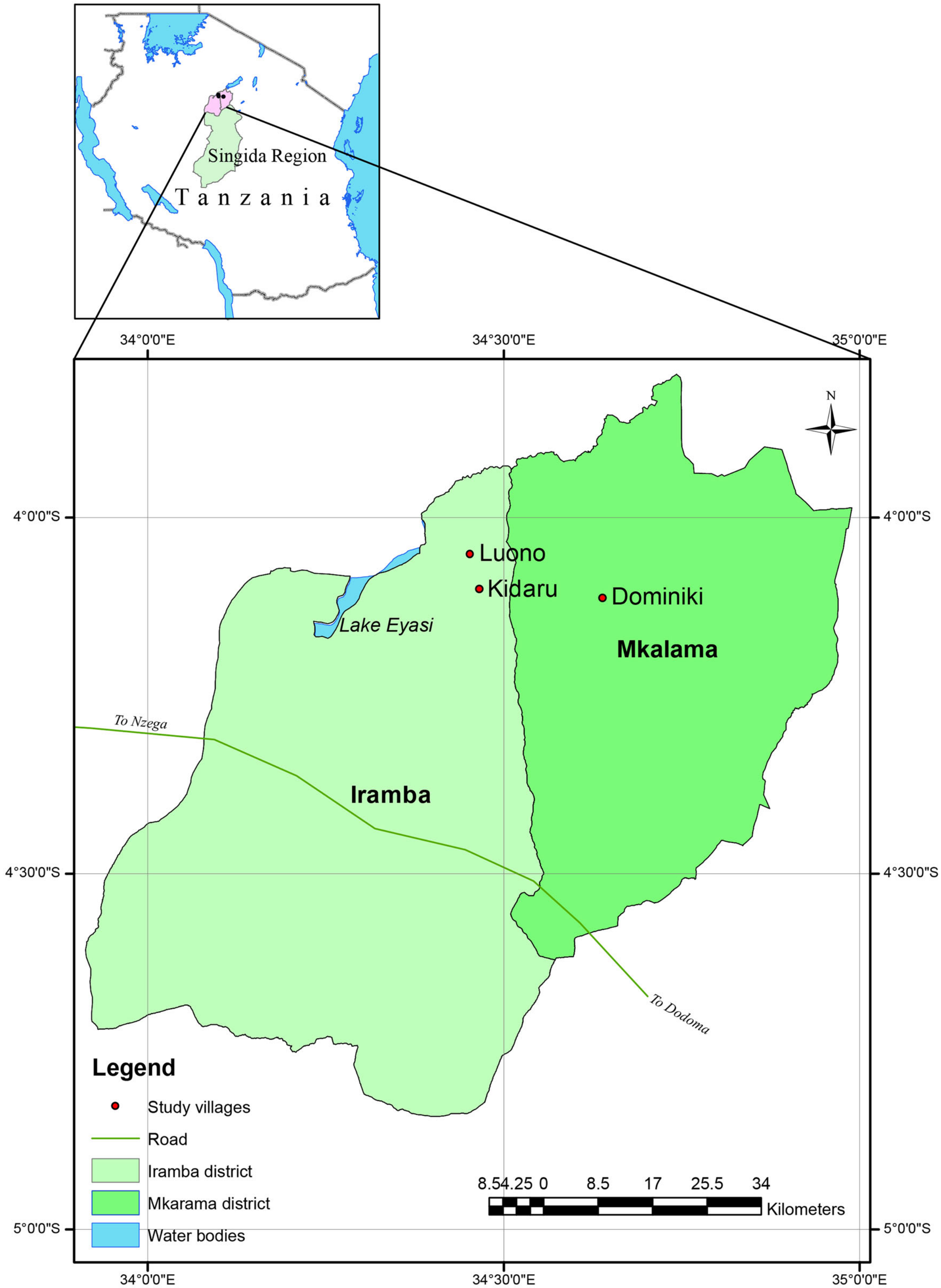


**Figure 2.** Field sites in Tanzania (source: Mutabazi & Boniface, 2021).

the implications of uncertainty for making decisions. These conditions make it harder to know when to plant, because even though it is increasingly clear to farmers that the rains now regularly arrive later, the erratic rainfall distribution adds to the conundrum. The difficulties posed for tobacco are particularly troubling, especially when grown under rainfed conditions. First, the shorter rainy season increases the risk that there will be insufficient time for the crop to mature, adversely affecting its commercial quality come harvest time. Second, when transferring tobacco plants from the seedbed to the ground, each plant requires a minimum of 5 L of water. Tobacco tends to be planted at densities of between 1200 and 1500 plants per ha. Farmers without access to stable irrigation, but instead relying on the rains told us that

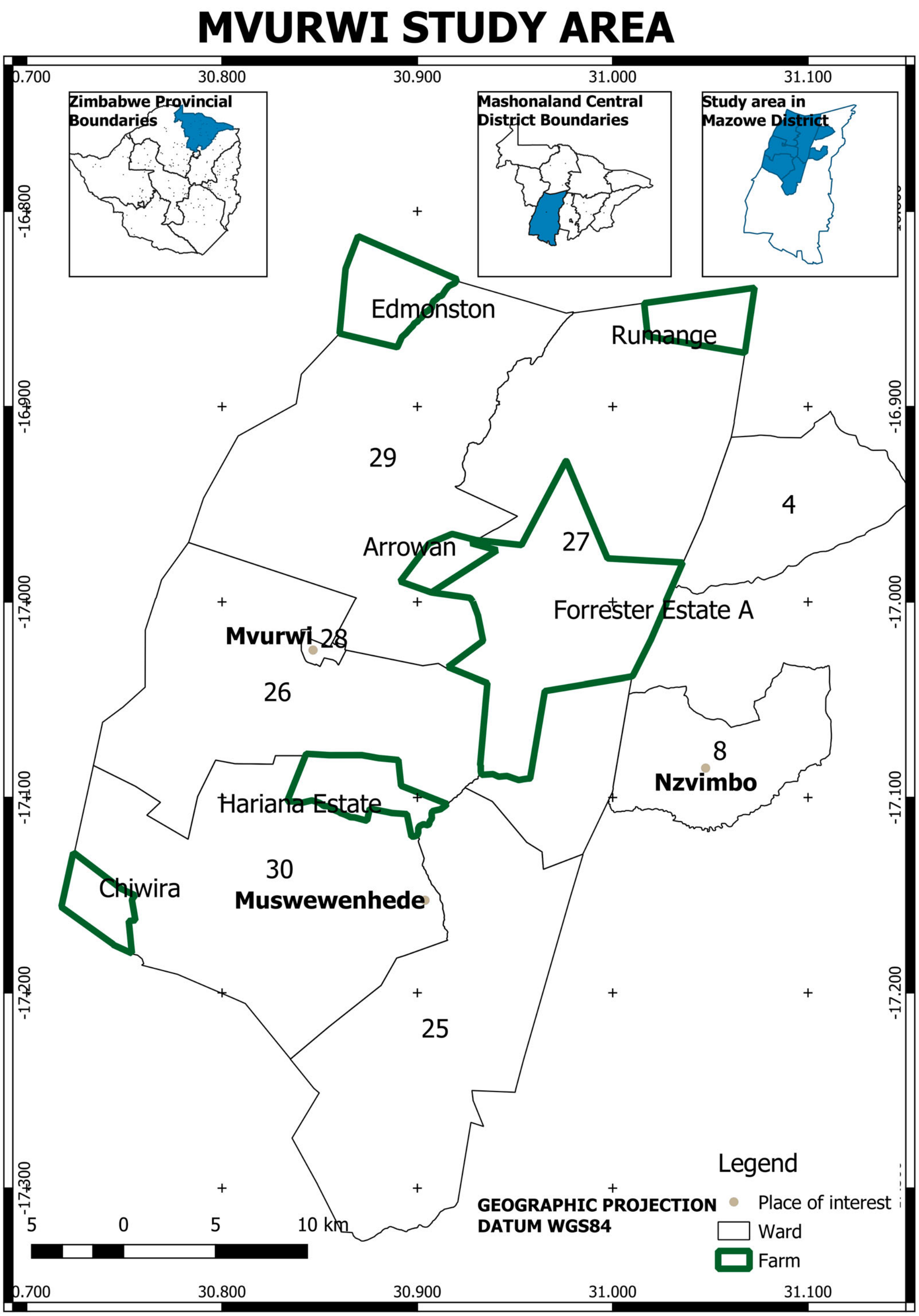


Figure 3. Zimbabwean field sites (source: Maguranyanga et al. (2021)).

insufficient rainfall and/or prolonged dry spells just after planting were at best diminishing crop quality, and at worst inducing crop failure. These difficulties were, moreover, leading some farmers, particularly in communal areas, to abandon tobacco production altogether.

These trends and accounts from farmers both flag the increasing requirement for irrigation to guarantee the commercial viability of tobacco production. This brings the dynamic pressures impinging on differentiated access to irrigation, amongst other prerequisites, sharply into focus. Whilst very few farmers across our field sites had mechanized irrigation infrastructure, there was a divergence of access to irrigation arrangements contrived, often contingent on access to labour, to mitigate the effects of uneven rainfall on the tobacco crop. As a rule of thumb, more A1 and A2 farmers were able to access such forms of irrigation than was the case for communal area farmers. Worryingly, those in greatest need of commercial tobacco production as a vehicle for poverty reduction were those worst affected by the drying trend and changes in rainfall patterns during the growing season, owing to insufficient

**Table 1.** Risk-Return trade-off decision space of crops in Singida, Tanzania. Source: Adapted from Mutabazi and Boniface (2021).

| Risk-return scenario | Luono | Kidaru | Dominiki |
|---|---|---|---|
| High risk High return | Not reported | Sesame, Tomato | Onion |
| High risk Low return | Maize | Maize | Maize |
| Low risk High return | Paddy, Sunflower, Chick pea | Paddy, Sunflower, Groundnut, Cotton | Sunflower, Groundnut, Chickpea |
| Low risk Low return | Pearl millet, Sweet potato | Sorghum, Sweet potato | Sorghum, Sweet potato |

access to the most effective adaptation options. The corollary here between poverty and vulnerability is not quite as neat as this might suggest, not least given that some people living in communal areas benefited from family members who had been given redistributed land. Nevertheless, tobacco farmers in communal areas tended to be more vulnerable to this changed distribution of land. climate.

It is unsurprising that against this backdrop, as Table 2 demonstrates, farmers consistently rank tobacco and maize as the crops most sensitive to climate impacts, across communal area, A1 and A2 farms. Yet high levels of climate sensitivity currently do not appear to make a majority of farmers decide against growing them, even factoring in reports from some farmers, especially in communal areas, that they have abandoned, or are abandoning, tobacco. One might say that farmers are actively courting vulnerability.

This finding is all the more striking when set within the wider array of factors that farmers consider when making decisions about cropping. Agricultural production is influenced by a series of dynamic pressures often in conflict with the sorts of decisions farmers might take if thinking solely in terms of reducing crop vulnerability to climate impacts. These include a variety of relational and structural access dynamics, including access to finance, inputs labour, storage, transport, markets and political connections/pressure from the state (see Newsham et al., 2021 for more detail). Crucially, across climate and wider factors which weigh upon farmers when deliberating on commercialization pathways, the principal cash crop, tobacco is the riskiest to choose, closely followed by the second most important crop, maize. Conversely – and perversely – crops such as rapoko, sweet potato and king onions, all of which are judged by farmers to be more resilient in the face of climate impacts, and lower risk across non-climate factors, are amongst those least grown, across farms on communal, A1 and A2 land. This is an important point of difference with Singida, in that most farmers could choose to grow such crops, which are better suited to environmental conditions. They were not nearly as dependent on access to soils and topographies which permitted some Tanzanian farmers to take advantage of changes in rainfall.

It remains, though, understandable that so many farmers in this area would choose tobacco, in spite of the risks. Mazowe has historically been the heart of tobacco production in Zimbabwe, in no small part owing to favourable agro-ecological growing conditions with historically high, reliable rainfall across the growing season. Support from government is available (albeit erratically and unevenly) for tobacco production, there are options for contract farming and financing, as well as infrastructure, be it good roads or auction houses, to help farmers get tobacco to an international market. Indeed, tobacco's status as a global export provides its trump card. Because it can be sold abroad, it is attractive as a source of US dollars. Access to a stable foreign currency which is accepted locally is an important way of reducing exposure to the ills of a local currency which for decades has suffered extreme volatility. Nevertheless, the extent of vulnerability when cultivating tobacco, the crop which can enable this stability, varies significantly across communal area, A1 and A2 farms. This is precisely because of the variation across and within these groups in relational and structural access to what we might term 'the means of adaptation'.

**Table 2.** Farmer ranking of aggregate crop sensitivity to climate impacts. Source: Newsham et al. (2021).

| Crop | Aggregated risk totals across climate impacts[a] | | | Aggregated risk totals across all farm types |
|---|---|---|---|---|
| | Chiweshe communal area | Hariana A1 | Arowan A2 | |
| Tobacco | 11 | 9 | 11 | 31 |
| Maize | 9 | 8 | 10 | 27 |
| Sugar Beans | 11 | 5 | 8 | 24 |
| Soya Beans | n/r | 7 | 10 | 17 |
| Tomatoes | n/r | 13 | n/r | 13 |
| Groundnuts | 5 | 6 | n/r | 11 |
| Cabbages | n/r | n/r | 9 | 9 |
| Cow peas | 7 | n/r | n/r | 7 |
| Sweet potato | 3 | 2 | 1 | 6 |
| Potatoes | n/r | n/r | 6 | 6 |
| King onions | n/r | 1 | n/r | 1 |
| Rapoko | 0 | 0 | n/r | 0 |

[a]This table is a reduction of annex 1 of Newsham et al. (2021). Rather than considering impacts relevant for each individual crop – drought, flood, erratic rainfall, pests etc – it gives the aggregate score each crop received across all impacts. n/r = not reported.

### *3.2 Adaptive capacity of farm-level commercialization strategies*

Farmers across both Tanzania and Zimbabwe are used to living with a range of uncertainties. However, the combination of climate change and other social-political changes are increasingly exceeding the limits of their adaptive capacity and, thereby, often making farm-level commercialization strategies highly vulnerable to climate impacts.

#### *3.2.1 Singida, Tanzania*

As noted in the previous section, changing risks associated with climate change are among the major drivers of commercialization pathways shaping farmers' choice of crop enterprises that differ in the level of riskiness and associated returns on investment. To respond to those, some farmers limit the sales of food crops for safeguarding food security, mainly due to production uncertainties associated with climate change. Apart from direct climatic shocks (e.g. droughts, dry spells and floods), production uncertainty is aggravated by surges in pests and diseases that seem to be intricately linked with climate and environmental changes. The Singida case showed how farmers devise risk management strategies as part of their efforts to commercialise to mitigate production risks. Such strategies, including tactical choice of planting window, farm diversification (crops and farms) and some irrigation practices, seem to be less effective with increasing climate and weather uncertainties and extremes, however. Dynamic pressures such as market failure and underdevelopment of the rural microfinance sector has left dryland farmers in the study areas with limited means of accessing investment capital and risk management products such as crop insurance.

The changing climate may create a farming opportunity that can be optimized to increase adaptive capacity and resilience, such as paddy farming. However, such efforts need technological support from outside. Farmers in Singida that saw increased river flows applied local means to divert water into the farms for paddy production. Such local diversion technologies cannot effectively control strong flows and in some cases have resulted in demolishing farms and settlements. Excessive rains in poorly drained farmland undermine crop productivity and accessibility, and hence hinder commercialization. Public investments that can help farmers manage the risks and even turn some risk factors such as excessive rains into farming opportunities include water harvesting, irrigation and drainage infrastructure and graded farm access roads.

Thus, whereas climate change closes established possibilities of commercialization for many, new 'opportunity spaces' it might create – to increase resilience in the face of changing risks, or take advantage of new opportunities – are only accessible to those with means to adjust accordingly. Farmers with limited means of managing production risk have to opt for low-risk, low-return crop production and hence remain locked in a 'subsistence trap' with limited prospects for commercialization. The new possibility for irrigation due to increased river flows is open to only farmers who can access land suitable for paddy production in the lowland closer to the river. Likewise, only farmers who can afford motor pumps can manage to lift irrigation water from shallow wells to the farms.

Livestock species differ in their resilience to altered climatic and environmental changes. As opposed to cattle and sheep as grazers, in case of denudation of grasses and fodder due to prolonged drought, goats can thrive by browsing on remaining shrubs. This has prompted changing animal herd composition away from cattle in favour of goats.

**Table 3.** Adaptation to 3 key climate risks across Chiweshe, Hariana (A1) & Arowan (A2).

| Climatic risks / Crops | Pests and diseases | Drought Adaptations | Erratic rainfall |
|---|---|---|---|
| Maize | Pesticides *Ch, Ha, Ar*<br>Pruning of affected leaves *Ha* | Drought resistant crops *Ch*<br>Irrigation *Ch, Ha*<br>Deep ploughing *Ha*<br>Winter ploughing *Ha*<br>Drought resistant varieties *Ha*<br>Seed cheating *Ar*<br>Gap filling *Ar* | Early or late planting *Ch*<br>Pruning of affected leaves *Ar*<br>Use of herbicides *Ha, Ar*<br>Make ridges *Ha*<br>Reapplication of fertilizers *Ha* |
| Tobacco | Pesticides *Ch, Ha, Ar* | Drought resistant varieties *Ch*<br>Irrigation *Ch. Ha, Ar*<br>Wetting the barns *Ha*<br>Reducing heat *Ha* | Early planting *Ch*<br>use of herbicides *Ar* |
| Sugar Beans | Winter ploughing *Ch*<br>Pesticides *Ha* | Do nothing *Ch, Ha, Ar* | Make ridges *Ch*<br>Do nothing, *Ar*<br>use of herbicides *Ar* |
| Sweet potato | Pesticides *Ch, Ha* | Irrigation *Ch*<br>Do nothing *Ha* | Do nothing *Ch, Ar*<br>Irrigation *Ha* |
| Rapoko | Do nothing *Ch, Ha* | Do nothing *Ch. Ha* | Do nothing *Ch, Ha* |
| Groundnuts | Pesticides *Ch, Ha* | Early planting *Ch*<br>Winter ploughing *Ch*<br>Plant when rains adequate *Ha* | Do ridges *Ch*<br>Plant when rains adequate *Ha* |

Key: *Ch* = Chiweshe; *Ha* = Hariana (A1); *Ar* = Arowan (A2).

### *3.2.2 Mazowe, Zimbabwe*

Table 3 provides a summary of the adaptation practices that farmers have developed in response, across key crops grown in the area, to the three climate risks of most concern. To a large extent, the findings in the table demonstrate that farmers across the field sites possess a good deal of adaptive capacity. The responses to the sorts of variation found across our field sites make much recourse to the techniques of modern agriculture. Yet the efficacy and necessity of these is contingent upon knoweledge and capacity to attune them to local agro-ecological conditions. In some cases this points towards a particular 'modern' agricultural technique, such as the use of fertilizers and pesticides. When it does, it quickly comes up against the fundamental constraint on these forms of adaptive capacity, namely that not everybody has access to them.

In other cases, it points to the selection of a different crop, better-adapted to a wider range of local climate variability. Two examples can help us to understand what these different choices and pathways can look like in practice. One communal area farmer we met had ventured into commercial tobacco production via a contract farming arrangement which had supplied him with fertilizer and extension advice on tobacco cultivation. His strategy was to plant early. However, owing to a prolonged dry spell, and without access to sufficient irrigation, his first crop, once transplanted from the seedbed, was lost. He planted again later in the year, with more success, but replanting came so late into the growing season that its commercial viability was uncertain. In addition to this risk, he had to absorb the transaction and opportunity costs of a failed harvest. Compare this with the account of another communal area farmer and local chairperson of the Zimbabwe Farmers Union, regarding the production of rapoko;

> "There are mistakes that farmers in this area make. A perception that these traditional crops have no market or that the returns are low is both misleading and unhelpful. I grow rapoko annually and sell it at good prices. The market is there locally and in Harare. The GMB also buys rapoko at very reasonable prices. I also grow sweet potatoes and get handsome returns annually. Buyers come from as far as Bulawayo to buy sweet potatoes from my farm and hire their own labour to harvest the crop."

It is no coincidence that both rapoko and sweet potato are well-adapted to local agro-ecological conditions and therefore fare better even in a changing climate. The question – to which we return in the following section – is why there is not more commercial activity around such better adapted crops.

### 3.3 Commercialization pathways and climate resilience

What does the changing context mean for the future of commercialization pathways, and what are the prospects for changing the vulnerability drivers? This section discusses the opportunities as well as the constraints farmers affecting vulnerability levels inherent within their commercialization pathways, and summarizes the overarching 'progression of vulnerability' for each country.

#### 3.3.1 Singida, Tanzania

The two central regions of Singida and Dodoma accounts for 54% of 503,032 metric tons of sunflower produced in the country (URT, 2021). Local production of oilseeds in Tanzania only meets about 40% of the domestic edible oil demand estimated at about 600,000 metric tons per annum – growing at about 3% annually (Mgeni et al., 2019; URT, 2016). Tanzania imports about 60% of its edible oil requirement including palm oil import valued at USD 250 million per year (USAID, 2017). The Tanzanian government is advancing an ambitious macroeconomic policy for edible oil import substitution through increased import tariff on edible oil to stimulate and protect the domestic edible oil industry. However, these, and interventions at the local level to bolster yields through better adapted seeds and improved agronomic practices, are still found to be inadequate to benefit smallholder farmers growing sunflower, and to have an impact at scale (Isinika and Jeckoniah, 2021).

The Singida case study show how farmers are using a number of strategies to navigate the changing risks associated with climate change, but that farm-level commercialization is ultimately dependent on a range of dynamic pressures including but not limited to public infrastructure, and social and economic services. Addressing ongoing changes, and taking advantage of possible new opportunities, require some accompanying changes in the existing system to be optimized. For example, farmers that embarked on paddy production cannot access improved paddy seeds from the current inputs system. As a result, they still grow paddy landraces that are low-yielding and with lower market demand. Likewise, farmers returning to cotton production after a decade may find their village lacking market infrastructure such as warehouses, whose quality have deteriorated. While farmers may prefer local landraces on other grounds, such as taste and cookability, they are increasingly susceptible to climate change and associated pests and diseases.

In some cases, market demand may override climate change signals to influence farmers' decisions. For example, farmers abandoned Khaki onion to start growing red onion (Red Bombay variety) with high demand in the market. However, Khaki had more drought-tolerance and storability qualities compared to red onions. As a result, Khaki variety is no longer grown and even the seeds are no longer locally available.

Production of most crops is negatively affected by a surge in crop pests and diseases that farmers connected to climatic and environmental changes. In some areas, however, farmers are able to benefit from good networks of agro-dealers that supply agro-chemicals and advisory services. The co-existence of smallholders and commercial elite farmers were found to help technology spill-over for some l farmers by creating new commercialization opportunities. At the same time, it is clear that further investments in farming infrastructure and services are needed to enable more farmers to take advantage of such opportunities.

Following a government initiative to be self-sufficient in edible oil supply, breeding efforts and importation of improved sunflower seeds have been scaled up. However, some high-yielding hybrids are expensive, and the majority of farmers cannot afford to buy them every season, as opposed to local varieties that are traditionally recycled. Some of these high-yielding hybrids are also more susceptible to excessive rains compared to open pollinated and local varieties. Farmers complained that existing pressing technology is not effectively squeezing out oil from oilseeds produced from hybrids that tend to stick in the press leaving much oil in the cake. To counter this technological deficiency, farmers are mixing the hybrids with local varieties at planting time to mixed oilseeds that can be effectively pressed.

Commercialization can address income poverty to enhance farm investments and hence foster local resilience to climate change and variability. The path to commercialization can be supported by a number of interrelated factors: increasing access to factor inputs – technology, capital and labour, and profitable market linkages. However, commercialization pathways can also work against inclusiveness and equity amongst smallholder farmers, pushing them towards the risk of maladaptive outcomes. The demand for land by incoming commercial farmers introduces new dynamics in the local land markets – rising rent and selling price. The inequities built into structures for land ownership as well as capital and asset accumulation appear to operate here at the level of root cause: the success in commercialization of some farmers in acquiring more capital to invest – in this instance in land – pushes up the entry barriers for other farmers with commercial aspirations, especially in the absence of pro-poor micro-credit schemes and other 'equalising' interventions. For example, the study found that for vulnerable social groups, the ability to commercialize was closely related to the equitable access, ownership and control over productive resources.

#### 3.3.2 Mazowe, Zimbabwe

The history of land in twentieth- and twenty-first century Zimbabwe is key to illustrating the longer-run progression of vulnerability prefiguring the barriers and opportunities that are differentially experienced by communal area, A1 and A2 farmers in Mazowe. It is also central to the wider prospects for bringing about climate-smart, poverty reducing commercial agriculture through tobacco cultivation.

Albeit in a manner which raised its own questions of justice, the Fast-Track Land Reform Process (FTLRP) at least partially reversed a historical injustice associated with the violent dispossessions of the colonial-era Land Apportionment Act. It brought opportunities for small-and medium-scale farmers formerly living in communal areas to commercialize through tobacco among other crops. Prior to the FTLRP, 98 per cent of tobacco was grown on large farms; yet by 2012, 53 per cent was grown by small-scale farmers and 26 per cent by medium-scale farmers (Sakata, 2018). By 2021, 65 percent of the crop was grown by small-scale farmers while medium scale farmers produced 27 percent (Shonhe, 2021). In 1980 there were roughly 1500 tobacco producers, but by 2018 that number had soared to 124,000 registered tobacco producers (Garwe, 2019; TIMB, 2018).

Moreover, this expansion in small and medium scale tobacco production has occurred even against the background of the drying and increasingly erratic rainfall trends we considered in previous sections. To some extent at least, it seems that the increased access to land has for A1 and A2 farmers led to greater access to financial resources to invest in irrigation, labour and inputs. This may have bolstered, albeit not straightforwardly or in all cases, adaptive capacity in the face of common forms of current climate variability and impacts. A1 farmers tend to have fewer constraints on land, greater irrigation access and more effective arrangements for pooling resources than communal area counterparts.

Here we arrive at one of the most potentially significant implications of one of the outcomes of the post-2000 land reform process. It may have modified the progression of vulnerability, albeit minimally and contingently, for some A1 and A2 tobacco farmers. Altering a distribution of land that had stood since colonial times has partially changed the characteristics and distribution of resources – a root cause of vulnerability – across Zimbabwean society. Linked to this, there seem to have been corresponding changes in some dynamic pressures, particularly in terms of the extent to which access to land has made tobacco markets available to more people, who have subsequently been able to invest in equipment and resources which can reduce the sensitivity of tobacco production as a livelihood to climate impacts. Having income from tobacco to build other assets and pay school fees can increase individual and household capacity. In short, and perhaps especially in relation to land reform in Southern Africa, it is not common that policy intervention might be said to effect change at the level of root causes, thereby giving us the chance to follow the effects along the causal chain. For this reason, ongoing research on tobacco production on redistributed land in Zimbabwe is highly important.

Of course, given wider constraints still facing farmers, it is inadvizable to make overly strong claims about a modified progression of vulnerability for A1 and A2 farmers: wider barriers remain. The adverse incorporation of Zimbabwean farmers in international tobacco value chains leaves both farmers and the country more broadly cut out of the higher margins that accrue from being able to process tobacco even minimally. Related to this are market and pricing difficulties. Farmers can sell tobacco merchants through the Tobacco Industry & Marketing Board (TIMB), which pays out up to 25 percent of the purchase price in the inflation-beset RTGS local currency, with commonly-reported payment delays. Or they can sell to the *Makoronyera* (black-market/informal traders), who will pay in US dollars but offer lower prices (see also Binswanger-Mkhize & Moyo, 2012; Shonhe, 2021). This makes it harder for farmers to accumulate sufficient capital to invest in adaptation technologies such as irrigation.

These difficulties are not limited to small-scale, communal area and A1 farmers, but also experienced by A2 farmers, who sometimes enter into so-called joint ventures with actors better placed to overcome them. The most common partners for joint ventures are Chinese, former commercial farmers, local private sector actors. These arrangements bring in financial and productive assets investment which is retained by the resettled farmers at the expiry of the contract, but the nature of the contract remains highly skewed in favour of international capital, due to poor and tilted pricing structure. Farmers get an estimated USD 0.15 compared to USD 0.85 for the merchant out of every USD 1 worthy of tobacco sold. Even through the government, through the TIMB recently started facilitating ‘public/private partnerships in localizing funding for tobacco production’ and encouraging ‘investors to pursue new tobacco and alternative markets’ (TIMB, 2022, p. 12) to reverse skewed trading patterns, these are long term strategic plans that will take time to reverse ongoing primitive capital accumulation currently benefitting international tobacco merchants. Besides, the term joint venture is used somewhat euphemistically when resettled farmers are mostly not involved in the management of the cropping programmes and typically receive +/−10 per cent of the gross income at the end of the season. It is in fact closer to a farm rental arrangement on poor terms for the landowner. It is arguably a sophisticated way of dispossessing resettled farmers of their means of production; it certainly operates to constrain access by Zimbabwean farmers to the higher reaches of the value chain. The lack of support from the Zimbabwean government to help farmers achieve more favourable terms effectively ends up serving the interests of international capital. The implications for small holder farmers are that limited capital accumulation potential farmers limit their ability to invest in improved seed varieties, irrigation infrastructure and mechanization that would combine to curtail chances of crop failure and improve farming viability and thus impact on farmers’ vulnerability.

Indeed, in this regard, the dominance of tobacco (and maize), towards which agricultural production and support systems in Mazowe tend to be skewed, makes it structurally more difficult for farmers to adopt better-adapted crops such as rapoko and sweet potato. That said, to some extent, there may be greater existing scope for commercialization in such crops than many farmers currently realise. This could be an entry point for considering where to focus support for fostering cropping choices that are both climate-resilient and commercially viable.

Looking beyond A1 and A2 production dynamics, though, it remains deeply troubling that for the majority of the communal area farmers we encountered, the structural disadvantage embodied in communal areas continues to make them vulnerable, unsafe places. In Chiweshe, constraints on land are high, partly owing to the absorption of displaced workers from former large white-owned farms. The lack of access to finance, inputs, the poor terms given for the contract farming that does offer some access to these, in tandem with dependence on increasingly erratic rains, is putting the prospect of commercial tobacco production out of reach. Money for essential costs such as school fees was in short supply. Subsistence agriculture frequently did not stave off hunger, and many of the farmers we met in Chiweshe were receiving food aid during the course of our fieldwork. It was in this communal area that there was the greatest need for climate-resilient, commercially viable agricultural opportunities; and where, simultaneously, these will be most difficult to engender.

## 4. Conclusions

Agricultural commercialization is commonly seen as a route out of poverty (Christiaensen et al., 2011; Lowder et al., 2016), and has been proposed as part of adaptation and climate-smart agriculture strategies. Yet as our research from Tanzania and Zimbabwe demonstrates, balancing commercialization and climate-resilience objectives in current smallholder farming in either country is fraught with difficulty. Indeed, our findings add empirical ballast to the arguments of commentators like Giller et al. (2021a, b) who question the proposition that commercializing agriculture in a variety of sub-Saharan African contexts is a means for poverty reduction for the majority of farmers; even if the questions of who benefits and to what extent remain important.

In practice, the picture is at best mixed. There are some prospects for commercial agriculture which assists with asset and capital accumulation and poverty reduction, and which seems at least to some extent to be weathering the storm for the meantime. In Tanzania, dryland farmers in Singida have historically lived with high levels of climate variability as a major driver determining a feasible range of crops and production practices, and the dryland farm-sector is considered to offer new opportunities for profitable production and commercialization. Yet there are stark differences with regards to which farmers have access to the land and capital for farming investments required for commercial production. Some new opportunities, moreover, such as increased rainfall have given rise to maladaptation; in the form, for instance, of ad hoc, unsuccessful and damaging experiments with spate irrigation.

Likewise, in Zimbabwe, farmers who have been allocated land under the Fast-Track Land Reform Programme have often been able to benefit from the commercial opportunities of tobacco. This cannot be divorced from a consideration of the extent to which land redistribution on this scale has modified the 'conditions of possibility' for small-scale commercial farming in Zimbabwe. However, there are probably more farmers, particularly those already facing structural constraints which leave them on the margins of commercial viability, who instead face more acutely the dilemma posed by double exposure (Leichenko & O'Brien, 2008; O'Brien & Leichenko, 2000). The choice is between, on the one hand, crops that are poorly adapted to climate change and sold in sometimes volatile international markets and, on the other hand, better-adapted crops with much lower commercial value. Choosing the latter is tantamount to returning to subsistence agriculture, which often cannot meet basic household needs and expenditures, let alone wider development aspirations.

Farmers in this position might be said, extrapolating from the work of Dercon on poverty traps (1996), to be facing an 'adaptation trap', and their dilemma is ultimately rooted in a lack of viable alternatives (cf. Giller et al., 2021b). It explains both (a) the precarious commercial prospects in Tanzania, as many farmers have to choose the crops they know to be better adapted but which do not find their way into markets; and (b) the adoption of tobacco in Zimbabwe by farmers who have subsequently had to abandon it on account of harvest failures. These result partly from a rainy season which has become too erratic to be reliable for tobacco production, and partly from a lack of access on the part of farmers to effective adaptation measures, most obviously stable irrigation.

This rather gloomy prognosis might lead some commentators to argue that these cases demonstrate only too well that climate change is already proving a fundamental risk to the scope for agricultural commercialization to be an engine of development and food security (i.e. World Bank, 2008, 2015). It might be argued that both countries are crying out for climate-smart agriculture (CSA), which is conceived with a view to avoiding precisely this type of trap. Certainly, in itself, the CSA paradigm addresses some fundamental dilemmas. In the predominant framings offered by the World Bank and the FAO, there is an acknowledgement that commercial agriculture cannot continue to be one of the biggest contributors, globally, to greenhouse gas emissions (for a detailed account of these contributions see i.e. IPCC, 2014 Vermeulen et al., 2012;). There is, likewise, the recognition that climate resilience needs to be foregrounded rather than sidelined, as it still often is, in agricultural development interventions (Kuhl, 2018). Reducing emissions from global agriculture would surely help smallholder farmers in Tanzania and Zimbabwe, particularly in terms of the magnitude of the climate impacts to which their commercialization efforts need to be resilient.

However, as critics of CSA have argued, the approach tends still to be primarily technocratic. As Marcus Taylor puts it, the World Bank's formulation of CSA "proposes a paradigm shift in agriculture without acknowledging the vast inequalities of access to land, inputs, water and food that stratify contemporary patterns of food production, distribution and consumption" (2018, p. 103). Its framing of resilience in terms of withstanding environmental shocks to the livelihoods of the poor naturalizes and, therein, depoliticizes inequalities rooted in much longer, historical socio-environmental processes (Hulme, 2011; Watts, 2015). It is harder to square, moreover, the productivist underpinnings of intensification, however ostensibly sustainable, with the priorities of resilience in social-ecological systems (Newsham et al., 2018; Schaafsma & Bell, 2018). These may better be served by redundancy and de-intensification in agricultural production systems (Kuhl, 2018; Taylor, 2018); although perhaps in particular those of the Global North (Struik & Kuyper, 2017).

The focus on the technical fix is evident in the Bank's CSA country profiles. For instance, the Zimbabwe profile (CIAT & World Bank, 2017) illustrates with commendable clarity the sorts of climate-smart techniques that could assist in the most common forms of crop and livestock production, and offers a qualitative indication of the extent of their adoption. Taking the case of tobacco as an example, however, it does not contend with the sorts of issues that surface when considering the broader political economy of tobacco production. It covers the complicity of tobacco in deforestation but without attention to its causes; such as contract farming which puts onto producers the costs of flue-curing the crop. It does not recognize the uneven distribution of vulnerability to climate impacts across land tenure categories (communal, A1, A2 etc.) and corresponding tobacco production systems, let alone their historical emergence. Nor does it take into account the limitations to commercial strategies for smallholder farmers. China is their main market, and in order to change their place at the bottom of the value chain, they would have to muscle in, somehow, on much wealthier Chinese investors, who are backed by a state which is proactive and effective at promoting their interests.

Without engaging with, let alone addressing, dynamics such as these, it is difficult to recommend using a CSA approach to make agricultural commercialization a climate-resilient option for poverty reduction in Tanzania and Zimbabwe look less promising. Ultimately, that will require a deeper reimagining and reshaping of the logics of commercialization. As they currently stand, looking to commercialization as a way out of poverty risks continuing to push millions of farmers – if by no means all – across Tanzania, Zimbabwe, Sub-Saharan Africa and beyond into a suboptimal choice between climate-sensitive cash crops and safer but poverty-reproducing staple crops.

## Notes

1. See Newsham et al. (2021) for more detailed exposition of the PAR framework, tensions and unacknowledged overlaps with relational ontological thinking.
2. The empirical material in this section is drawn from the longer case studies of Mutabazi and Boniface (2021) for Tanzania, and Newsham et al. (2021) for Zimbabwe.
3. The farmers (*Nyiramba*) settled first on upland as lowland plains were seen barren and vulnerable to flooding. The pastoral *Sukuma* arrived later and settled with their livestock on the vast the lowland floodplains. The *Sukuma* had experience in lowland paddy farming using the *majaruba* system to contain rainwater for paddy production. Over recent times, rains have been in most cases falling above long-term averages, hence supported paddy production – but occasionally falling violently causing devastating flash floods.

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